WHAT IS CLAIMED IS:

1. Storage system having a plurality of disk drives, wherein

at least one of said disk drives of the storage system is a spare disk drive, and

said storage system monitors a status of error occurrence in each of said disk drives, starts mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified first value and performs reading from said spare disk drive when said number of errors occurred of said disk drive exceeds a specified second value greater than said specified value level 1.

2. Storage system having a plurality of disk drives, wherein

at least one of said disk drives of the storage system is a spare disk drive, and

said storage system has:

an error monitor section which monitors a status of error occurrence in each of said disk drives and instructs initiation of mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified first value , instructs initiation of blockade of said disk drive when said number of errors occurred of said disk drive exceeds a specified second value greater than said specified first value, and instructs shifting of a process which has been performed by said disk drive to

said spare disk drive,

a mirror section which performs mirroring between said disk drive and said spare disk drive, and

a blockade/shift section which performs blockade

5 of said disk drive and said shifting.

3. Storage system having a plurality of disk drives, wherein

at least one of said disk drives of the storage system is a spare disk drive, and

10 said storage system has:

an error monitor section which monitors a status of error occurrence in each of said disk drives and instructs initiation of mirroring between that disk drive and said spare disk drive when a number of errors

15 occurred of said disk drive exceeds a specified value, clears mirroring of said spare disk drive when a number of errors occurred of that disk drive which is not undergoing mirroring exceeds said number of errors occurred of said disk drive that is undergoing

20 mirroring, and instructs initiation of mirroring between said disk drive not undergoing mirroring and said mirroring-cleared spare disk drive, and

a mirror section which performs mirroring between said disk drive and said spare disk drive.

25 4. Storage system having a plurality of disk drives laid in an array, wherein

at least one of said disk drives of the storage system is a spare disk drive, and

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said storage system has:

an error monitor section which monitors a status
of error occurrence in each of said disk drives and
gives such an instruction as to set the status of said
5   disk drive in a temporarily blocked state, and

a data restoring section which, when a disk drive
constituting a disk array group becomes said temporary
blocked state, restores data of said temporary blocked
disk drive from another disk drive constituting said
10   disk array group to said spare disk drive, and performs
reading from said temporary blocked disk drive when
reading from said another disk drive constituting said
disk array group is not possible during data
restoration.

15   5.   Storage system having a plurality of disk
drives, wherein at a time of data shifting between disk
drives, a number of read errors occurred from a data-
shifting disk drive is stored, data from said data-
shifting disk drive is read into a shifting-destination
20   disk drives until said number of errors occurred
reaches a specified value, data reading is switched to
data reading from a disk drive constituting a disk
array group when said number of errors occurred reaches
said specified value, and data reading from said data-
25   shifting disk drive is executed when data reading from
said disk drive constituting said disk array group is
in error and data restoration is not possible.

6.   The storage system according to claim 5,

wherein after data reading is switched to data reading

from said disk drive constituting said disk array group,

when data reading from said disk drive constituting

said disk array group is in error, data reading is

5   switched to data reading from said data-shifting disk

drive and that data reading is successful, data of that

disk drive constituting said disk array group which has

had a read error is restored by using said data read

from said data-shifting disk drive and said data from

10   said disk drive constituting said disk array group.

7.   Storage system having an array of disk drives,

at least one of which is a spare disk drive, wherein

said storage system has:

an error monitor section which monitors a status

15   of error occurrence in each of said disk drives with a

disk array group constituted by said disk drives as one

unit, and instructs initiation of shifting of data of

that disk drive whose number of errors occurred exceeds

a specified value to said spare disk drive,

20   an error-count specified value changing section

which dynamically changes said specified value to a

smaller value when said numbers of errors occurred of

said plurality of disk drives of said disk array group

reach a sub specified value set smaller than said

25   specified value, and

a copy section which performs data copying upon

reception of that shifting instruction.

8.   An error monitor control program for storage

system having a plurality of disk drives, at least one of which is a spare disk drive, wherein

said error monitor control program monitors a status of error occurrence in each of said disk drives, starts mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified first value and performs reading from said spare disk drive when said number of errors occurred of said disk drive exceeds a specified second value greater than said specified first value .

9. An error monitor control program for storage system having an array of disk drives, at least one of which is a spare disk drive, wherein

said error monitor control program has:

an error monitor program which monitors a status of error occurrence in each of said disk drives and instructs initiation of mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified first value , instructs initiation of blockade of said disk drive when said number of errors occurred of said disk drive exceeds a specified second value greater than said specified first value, and instructs shifting of a process which has been performed by said disk drive to said spare disk drive,

a mirror program which performs mirroring between said disk drive and said spare disk drive, and

a blockade/shift program which performs blockade

of said disk drive and said shifting.

10. An error monitor control program for storage system having a plurality of disk drives, at least one of which is a spare disk drive, wherein

5   said error monitor control program has:

an error monitor program which monitors a status of error occurrence in each of said disk drives and instructs initiation of mirroring between that disk drive and said spare disk drive when a number of errors

10   occurred of said disk drive exceeds a specified value, clears mirroring of said spare disk drive when a number of errors occurred of that disk drive which is not undergoing mirroring exceeds said number of errors occurred of said disk drive that is undergoing

15   mirroring, and instructs initiation of mirroring between said disk drive not undergoing mirroring and said mirroring-cleared spare disk drive, and

a mirror program which performs mirroring between said disk drive and said spare disk drive.

20   11. An error monitor control program for storage system having a plurality of disk drives laid in an array, at least one of which is a spare disk drive, wherein

said error monitor control program has:

25.   an error monitor program which monitors a status of error occurrence in each of said disk drives and gives such an instruction as to set the status of said disk drive in a temporarily blocked state, and

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a data restoring program which, when a disk drive constituting a disk array group becomes said temporary blocked state, restores data of said temporary blocked disk drive from another disk drive constituting said

5   disk array group to said spare disk drive, and performs reading from said temporary blocked disk drive to thereby ensure data restoration when reading from said another disk drive constituting said disk array group is not possible during data restoration.

10   12.   An error monitor control program for storage system having an array of disk drives, comprising:

an error count storing program which, at a time of data shifting between disk drives, stores a number of read errors occurred from a data-shifting disk drive,

15   and

a data monitoring/shifting program which reads data from said data-shifting disk drive into a shifting-destination disk drives until said number of errors occurred reaches a specified value, switches

20   data reading to data reading from a disk drive constituting a disk array group when said number of errors occurred reaches said specified value, and executes data reading from said data-shifting disk drive only when data reading from said disk drive

25   constituting said disk array group is in error and data restoration is not possible.

13.   The error monitor control program according to claim 12, further having a data restoration program

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by which, when data reading from said disk drive constituting said disk array group is in error after data reading is switched to data reading from said disk drive constituting said disk array group, data reading

5   is switched to data reading from said data-shifting disk drive only when data restoration is not possible and that data reading is successful, data of that disk drive constituting said disk array group which has had a read error is restored by using said data read from

10   said data-shifting disk drive and said data from said disk drive constituting said disk array group.

14.   An error monitor control program for storage system having a plurality of disk drives, at least one of which is a spare disk drive, wherein

15   said error monitor control program has:

an error monitor program which monitors a status of error occurrence in each of said disk drives with a disk array group constituted by said disk drives as one unit, and instructs initiation of shifting of data of

20   that disk drive whose number of errors occurred exceeds a specified value to said spare disk drive,

an error-count specified value changing program which dynamically changes said specified value to a smaller value when said numbers of errors occurred of

25   said plurality of disk drives of said disk array group reach a sub specified value set smaller than said specified value, and

a copy program which performs data copying upon

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reception of that shifting instruction.

15. An error monitor control method for storage system having a plurality of disk drives, at least one of which is a spare disk drive, wherein

said error monitor control method includes:

an error monitor method which monitors a status of error occurrence in each of said disk drives, and starts mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified first value , and

a reading method which performs reading from said spare disk drive when said number of errors occurred of said disk drive exceeds a specified second value greater than said specified first value .

16. An error monitor control method for storage system having an array of disk drives, at least one of which is a spare disk drive, wherein

said error monitor control method includes:

an error monitor method which monitors a status of error occurrence in each of said disk drives and instructs initiation of mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified first value , instructs initiation of blockade of said disk drive when said number of errors occurred of said disk drive exceeds a specified second value greater than said specified first value , and instructs shifting of a process which has been performed by said disk drive

to said spare disk drive,

a mirror method which performs mirroring between said disk drive and said spare disk drive, and

a blockade/shift method which performs blockade of said disk drive and said shifting.

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17. An error monitor control method for storage system having a plurality of disk drives, at least one of which is a spare disk drive, wherein

said error monitor control method includes:

10 an error monitor method which monitors a status of error occurrence in each of said disk drives and instructs initiation of mirroring between that disk drive and said spare disk drive when a number of errors occurred of said disk drive exceeds a specified value, -

15 clears mirroring of said spare disk drive when a number of errors occurred of that disk drive which is not undergoing mirroring exceeds said number of errors occurred of said disk drive that is undergoing mirroring, and instructs initiation of mirroring

20 between said disk drive not undergoing mirroring and said mirroring-cleared spare disk drive, and

a mirror monitor method which performs mirroring between said disk drive and said spare disk drive.

18. An error monitor control method for storage

25 system having a plurality of disk drives laid in an array, at least one of which is a spare disk drive, wherein

said error monitor control method includes:

an error monitor method which monitors a status of error occurrence in each of said disk drives and gives such an instruction as to set the status of said disk drive in a temporarily blocked state, and

5   a data restoring method which, when a disk drive constituting a disk array group becomes said temporary blocked state, restores data of said temporary blocked disk drive from another disk drive constituting said disk array group to said spare disk drive, and performs

10   reading from said temporary blocked disk drive to thereby ensure data restoration when reading from said another disk drive constituting said disk array group is not possible during data restoration.

19.   A data shifting method for storage system

15   having an array of disk drives, including:

an error count storing method which, at a time of data shifting between disk drives, stores a number of read errors occurred from a data-shifting disk drive, and

20   a data monitoring/shifting method which switches data reading to data reading from a disk drive constituting a disk array group when said number of errors occurred reaches said specified value, and executes data reading from said data-shifting disk

25   drive when data reading from said disk drive constituting said disk array group is in error and data restoration is not possible.

20.   The data shifting method according to claim

19, further having a data restoration method by which, when data reading from a redundant disk drive is in error after data reading is switched to a system of data reading/data restoring from said disk drive

5 constituting said disk array group, data reading is switched to data reading from said data-shifting disk drive only when data restoration is not possible and that data reading is successful, data of that disk drive constituting said disk array group which has had

10 a read error is restored by using said data read from said data-shifting disk drive and said data from said disk drive constituting said disk array group.

21. A data shifting method for storage system having a plurality of disk drives, at least one of

15 which is a spare disk drive, wherein

said data shifting method includes:

an error monitor method which monitors a status of error occurrence in each of said disk drives with a disk array group constituted by said disk drives as one

20 unit, and instructs initiation of shifting of data of that disk drive whose number of errors occurred exceeds a specified value to said spare disk drive,

an error-count specified value changing method which dynamically changes said specified value to a

25 smaller value when said number of said disk array group reaches a sub specified value set smaller than said specified value, and

a copy method which performs data copying upon

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reception of that shifting instruction.